

MALACOLOGY.—*The subgenus Halopsephus Rehder, with notes on the Western Atlantic species of Turbo and the subfamily Bothropomatinae Thiele.* ROBERT ROBERTSON, Museum of Comparative Zoölogy, Harvard University. (Communicated by Harald A. Rehder.)

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Study of the Caribbean turbinid genus *Halopsephus* Rehder (1943) has led to the conclusion that the single species—*H. pulchra* Rehder—belongs in the genus *Turbo*, with *Halopsephus* ranked as a subgenus. This necessitates renaming the species, for there is a prior *Turbo pulcher*. A growth series was recently dredged off the eastern coast of Great Abaco in the northeastern Bahamas and this has made possible comparisons with other turbinids. Notes on the four Recent Western Atlantic species of *Turbo* now recognized are here included. The conclusion is also reached that the subfamily Bothropomatinae, based by Thiele (1924) on a single specimen from the Red Sea, is founded on a juvenile turbinid (possibly *Turbo*) and is therefore invalid.

I wish to thank Dr. Harald A. Rehder, United States National Museum, Washington, D. C. (U.S.N.M.), for much assistance, for having authorized study of the radula of the holotype of *Halopsephus pulchra* under his care, and for allowing me to rename the homonym resulting from the change in rank of *Halopsephus*. The species is here renamed *Turbo (Halopsephus) haraldi*, after Dr. Rehder. Help was also received from Dr. Myra Keen, Stanford University; Dr. K. Oyama, Tokyo; Dr. W. P. Woodring, U. S. Geological Survey, Washington, D. C., and Drs. W. J. Clench and R. D. Turner, Museum of Comparative Zoölogy, Harvard University (M.C.Z.). A juvenile specimen of *Turbo castanea* was examined at the Academy of Natural Sciences of Philadelphia (A.N.S.P.).

Family TURBINIDAE
Genus **Turbo** Linnaeus

Turbo Linnaeus, Syst. Nat., ed. 10: 761. 1758.
Type species: *Turbo petholatus* Linnaeus, 1758 [Indo-Pacific], by subsequent selection, Montfort, Conch. Syst. 2: 203. 1810.

Adult shell turbate or trochoid, solid, nacreous within; aperture circular. Operculum cal-

careous, paucispiral. Five pairs of radular laterals; centrals varied (Troschell, 1878).

Subgenus **Turbo**, s.s.

Adult shell smooth, polished, imperforate; operculum smooth and polished at the center, granulose at the edges. Body of central tooth of radula expanded posteriorly into supporting wings; basal plate beneath this.

Turbo pittieri Dall (1912) from the Upper Pliocene (*vide* W. P. Woodring, *in litt.*) of Limón, Costa Rica, may belong in this subgenus.

Subgenus **Halopsephus** Rehder

Halopsephus Rehder, Proc. U. S. Nat. Mus. 93: 191. 1943. Type species: *Halopsephus pulchra* Rehder, 1943 [= *Turbo (Halopsephus) haraldi* Robertson, 1957], by original designation.

Adult shell smooth, polished, imperforate; convex outer surface of operculum sculptured by one whorl of axial, retractively curved, rugose ribs. Radula (Fig. 3) similar to *Turbo*, s.s.

Monotypic.

Turbo (Halopsephus) haraldi, n. name

Figs. 1-3

Halopsephus pulcher Rehder, Proc. U. S. Nat. Mus. 93: 191, pl. 20, figs. 3, 10. 1943; (corrected to *pulchra*) Poirier, An up-to-date systematic list of 3200 seashells from Greenland to Texas, p. 26 (mimeogr.). 1954; non *Turbo pulcher* Dillwyn, Catal. Shells 2: 855. 1817; non *Turbo pulcher* Reeve, Conch. Systematica 2: 167. 1842.

Description.—Adult shell solid, broadly conical, 11 mm high, nearly smooth, imperforate. Early nuclear whorls planate, white. Juvenile (3 whorls) carmine, with two carinae at the periphery, the upper one bearing short flattened spines; broadly umbilicate, the umbilicus bordered by nodes (Figs. 1-2). Lower carina enclosed in succeeding whorls; upper (stellate) carina becoming obscure in the third and fourth whorls. Umbilicus closed by parietal callus at this stage. Adult (5¼ whorls) cinnamon-rufous to apricot orange, spotted with white, palest at the base. Juvenile operculum with a subcentral pit (Fig. 1), mi-

nutely granulate. Adult operculum as in subgeneric description above.

Measurements.—As follows:

	Height	Width
Holotype	11.2 mm	11.0 mm
Paratype	6.0	6.0

Types.—Holotype, U.S.N.M. 500638. "Dredged off Lazaretto, Barbados, in shallow water on rocky bottom by John B. Henderson, Jr. while on the Smithsonian-University of Iowa 1918 Expedition." Paratype, U.S.N.M. 500639. "On the same trip off Payne's Bay Church, Barbados, in 50 fathoms on sandy and stony bottom" (Rehder, 1943).

Other specimens examined.—Six specimens (one alive) dredged in 37½ to 41½ fathoms about 3 miles ENE. of North Point, Elbow (Little Guana) Cay, off the eastern shore of Great Abaco, Bahamas, on August 5, 1955, by the writer (M.C.Z. 212954). One specimen (poor condition) dredged about 1 mile ENE. of the preceding station on the same day, in 50 fathoms (M.C.Z. 212955). All these Bahamian specimens are juvenile.

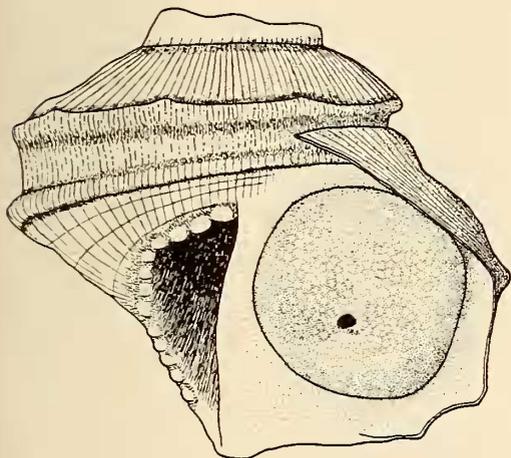


FIG. 1.—*Turbo (Halopsephus) haraldi* Robertson. Juvenile (2.1 mm in width), apertural view. Great Abaco, Bahamas (M.C.Z. 212954).

Range.—The known range of this species, previously known only from two specimens from Barbados, is now extended nearly 1,500 miles, to Great Abaco, northeastern Bahamas. Only nine specimens in museums are known to the writer at the present time. Undoubtedly more dredging in the Caribbean sublittoral will bring to light additional material at other localities.

Ecology.—The bottom on which the specimens were dredged near Great Abaco (37½ to 50 fathoms) is rocky, covered with calcareous algae, sponges, bryozoa and tunicates. Since most of these organisms are red the scarlet shell color may be protective. The one live juvenile was found in a red sponge.

Subgenus *Taeniaturbo* Woodring

Taeniaturbo Woodring, *Mioc. Moll.* Bowden, Jamaica 2 Carnegie Inst. Washington Publ. 385: 7, 408. 1928. Type species: *Turbo canaliculatus* Hermann, 1781, by original designation. *Taenioturbo* 'Woodring' of Rehder and Abbott.

Spirally ribbed; initial whorls red; obsolete spiral sculpture on outer surface of operculum.

Turbo (Taeniaturbo) canaliculatus Hermann

TURBO (canaliculatus) Hermann, *Der Naturforscher* 16: 52, pl. 2, figs. 1-2. 1781. No locality cited. Hedley & Pilsbry, *Nautilus* 26: 46. 1912.

Turbo spenglerianus Gmelin, *Syst. Nat.*, ed. 13: 3595. 1791. "Oceano indico" [sic].

This is not the *Turbo canaliculatus* of either Gmelin or Kiener.

Range.—Southern Florida, the Greater Antilles, Guadeloupe, possibly south to Bahia (Salvador), Brasil.

Turbo (Taeniaturbo) filiosus (Wood)

Trochus filiosus Wood, *Suppl. Index Testac.*: 17, pl. 5, *Trochus*, fig. 23. 1828. No locality cited.

Turbo cailletii Fischer and Bernardi, *Journ. Conchyliologie* 5: 294, pl. 9, figs. 10, 11. 1857. "Côtes de la Basse-Terre (Guadeloupe). Recueilli sur la nasse d'un pêcheur."

Range.—Southern Florida, the Bahamas, Cuba, west to Yucatán and Nicaragua (?), and south to Guadeloupe.

Subgenus *Marmorostoma* Swainson

Marmorostoma Swainson, *Zool. Illustr.* (2) 1: pt. 3, pl. 14. 1829. Type species: *Turbo chrysostomus* Linnaeus, 1758 [Indo-Pacific], by original designation.

Senectus 'Humphreys' Swainson, *Treat. Malac.*: 206, 213-215, 348. 1840. Type species: *Turbo chrysostomus*, by subsequent selection, Hermannsen, *Indic. Gen. Malac.* 2: 438. 1848.

Marmorostoma 'Swainson' of Gray and many subsequent authors.

Shell spiny or nodulose; operculum smooth, minutely granulated, or obliquely striate at the edge. Radula as in *Turbo*, s.s.

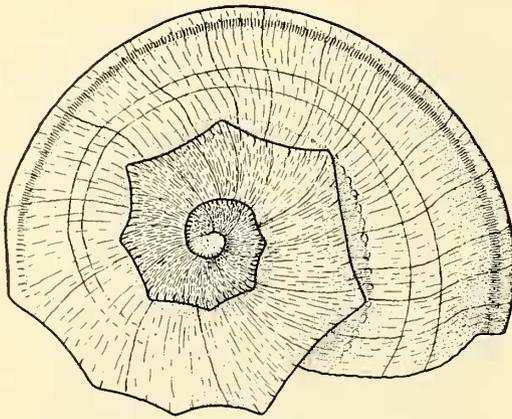


FIG. 2.—Same as Fig. 1. Apical view.

Turbo (Marmarostoma) castanea Gmelin

Turbo Castanea Gmelin, Syst. Nat., ed. 13: 3595. 1791. "Habitat in mari, Americam australem alluente."

Turbo crenulatus Gmelin, *ibid.* 1791. No locality cited.

Lunatica granulata Röding, Mus. Bolten.: 102. 1798; non *Turbo granulatus* Gmelin, 1791.

Turbo mammillatus Donovan, Nat. Hist. Brit. Shells 5: pl. 173. 1804. "Scilly rocks, at the western extremity of Cornwall" (England) ballast.

Turbo hippocastanum Lamarek, Anim. sans Vert. 7: 47. 1822. "Mers de l'Amérique australe."

Trochus (Turbo) quadriseriatus Anton, Verzeichniss Conch.: 59. 1839. No locality cited.

Turbo virens Philippi (ex Anton MS), Zeitschr. Malak. 5: 99. 1848. No locality cited.

The specific name *castanea* was used by Gmelin as a noun in apposition.

Range.—Florida, the Bahamas, and the Greater Antilles, north (probably sporadically) to North Carolina, Bermuda (fossil); west to Campeche and Yucatán, and south through the Lesser Antilles to Trinidad and Margarita Island. *Turbo (Marmarostoma) squamiger* Reeve, 1843, is probably the Eastern Pacific analogue.

Lives on *Thalassia testudinum* in the Bahamas.

KEY TO THE RECENT WESTERN ATLANTIC SPECIES OF TURBO, S.L. BASED ON ADULT SHELLS

- 1. Spirally nodulose; initial whorls not red.
 - castanea*
 - Spirally ribbed or nearly smooth; initial whorls red..... 2
- 2. Nearly smooth, reddish orange, mottled with white; operculum strongly sculptured exteriorly with spiral riblets..... *haraldi*
- Spirally ribbed, brown or greenish; obsolete spiral sculpture on outer surface of operculum..... 3

- 3. Imperforate; suture channeled; spiral ribs subequal; up to 93 mm high.... *canaliculatus*
- Umbilicate; flat subsutural area; spiral ribs unequal; less than 30 mm high..... *filosus*

DISCUSSION

The similarity of *Halopsephus* to *Turbo*, s.s., is striking; the main difference between the two is that the outer surface of the operculum of the latter is smooth, while in the former it is ribbed when adult. *Halopsephus* is smaller than *Turbo*, s.s. For these reasons *Halopsephus* is here reduced to the rank of a subgenus of *Turbo*.

When juvenile, *Turbo (Halopsephus) haraldi* is very similar in shell form to juvenile *Turbo (Marmarostoma) castanea*. Pilsbry and McGinty (1945) have illustrated the latter from a shell dredged in 50 fathoms off Palm Beach, Fla., which I have examined (A.N.S.P. 181123). This specimen was obtained dead, so the juvenile operculum is not yet known. The chief difference between juveniles of the two species is that *T. haraldi* is bright carmine, while *T. castanea* is whitish.

Juvenile *Halopsephus* is also similar to juvenile *Taeniaturbo*. *Turbo canaliculatus* and *T. filus* are both carmine and are initially stellate at the periphery, but differ from *T. haraldi* in the early development of numerous strong spiral ribs, one of which arises from the spinose carina. In *T. haraldi* the carina becomes obscure in the third and fourth whorls. The juvenile of a Miocene species from Bowden, Jamaica, referred by Woodring (1928) to *Taeniaturbo*, is also similar to *T. haraldi*.

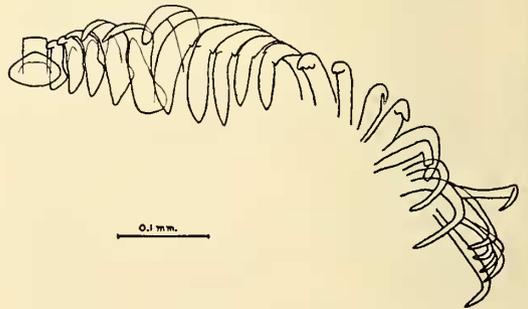


FIG. 3.—*Turbo (Halopsephus) haraldi* Robertson [= *Halopsephus pulchra* Rehder]. Radula of holotype (U.S.N.M. 50063S). Barbados.

An opercular pit like that in juvenile *Halopsephus* is frequent among young (and some adult) turbinids. It can be seen in several other species of *Turbo* and also in the Caribbean *Astraea* (*Lithopoma*) *caelata* (Gmelin), among others.

Not all species of *Turbo* have a nodulate ridge bordering the juvenile umbilicus. One that does not is *Turbo stamineus* Martyn [= *Turbo* (*Ninella*) *torquatus* Gmelin, 1791], illustrated by Kesteven (1901). The umbilicus persists in the adult in this Australasian species.

Thiele (1924) has founded a subfamily of the Turbinidae—the Bothropomatinae—on a single specimen from Kosseir (Quseir), Egypt, near the northern end of the Red Sea. This he named *Bothropoma isseli*. The characters of the shell suggest that it is juvenile. There are strong spiral ridges, the umbilicus is bordered by a nodulate ridge and the operculum has a large central pit. There are four pairs of radular laterals (Thiele, 1924, 1929). This is probably a young *Turbo*, despite the fact that all species of *Turbo* and the related genus *Astraea* that have so far been studied have five pairs of radular laterals. Thiele's specimen may have been abnormal (whole longitudinal rows of radular teeth are sometimes absent teratologically among gastropods), or perhaps the radula as well as the shell of *Bothropoma* shows juvenile characters. The cusps of the *Halopsephus* radula are much more strongly serrate in the juvenile than in the adult, but there are five pairs of laterals in the juvenile. The cusps in *Bothropoma* are strongly serrate. The central tooth, as figured by Thiele (1924), has posterior supporting wings, similar to those in *Turbo*, s.s., *Halopsephus*, and *Marmarostoma*. Thiele (1935) has subsequently reported *Bothropoma* from Western Australia as well as the Red Sea.

The Japanese turbinid *Liotia pilula* Dunker, 1860, designated the type species of a new genus—*Neocollonia*—by Kuroda & Habe (1952, 1954), was placed by them in the Bothropomatinae on the basis of what is here considered insufficient evidence of

close affinity with *Bothropoma*: merely that the shell is spirally ribbed, has an umbilicus bordered by a nodulate ridge, and that the operculum has a central pit. The radula is very simple; the cusps are not serrate as in *Bothropoma*, and there are five rather than four pairs of laterals. This species has since been incorrectly transferred to the genus *Bothropoma* by Kuroda (1956, spelled *Bathropoma*).

An umbilicus bordered by a nodulate ridge is here regarded as a primitive character among turbinids, for the following reasons. In early ontogenetic stages most turbinids show these features, and the operculum usually has a central pit on the outer surface. Furthermore, perforate shells must necessarily have originally preceded imperforate shells in the phylogenies of asymmetrically coiled aspidobranchs (archaeogastropods), for these were undoubtedly derived from bellerophonts, which were symmetrically coiled (isostrophic). *Neocollonia* is here regarded as a primitive (or possibly neotenous) turbinid, as it shows these primitive characters when adult and has a very simple radula.

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